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ABSTRACT

Information is presented to help medical technology schools abroad evaluate their credentials in comparison to U.S. requirements. After defining the subfields of medical technology, also called medical laboratory science, a summary is provided of the educational requirements, the professional titles, and the certification recognition of medical laboratorians in the United States by two credentialing agencies. The systems of medical laboratory science education in Belgium, Costa Rica, Sweden, and the United Kingdom are reviewed and compared to medical laboratory science education in the United States. Data are included on the rate of access to upper secondary education in these countries and on the science requirements for professional recognition of medical laboratory science or medical technologists. Case studies of two medical laboratory science students who came to Northeastern University from other countries (Germany and Iran) are presented. Appendices include the addresses of U.S. accrediting/credentialing agencies, as well as national professional associations for medical laboratory technologists in Belgium, Sweden, the United Kingdom, and the United States. (SW)

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MEDICAL LABORATORY SCIENCE: AN INTERNATIONAL COMPARISON FOR CREDENTIALS EVALUATORS

PRESENTATION AT

NAFSA ANNUAL MEETING

CINCINNATI

1983

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During the last few years there has been a steady increase of inquiries to the Center for International Higher Education Documentation (CIHED) and the Medical Laboratory Science Program at Northeastern University by laboratorians educated abroad for assistance in evaluating their foreign credentials. Their reason for the request is to assess their credentials in U.S. terms in order to study or to work in the United States. Regulations imposed on independent laboratories that need reimbursement from Medicare and Medicaid establish very specific educational requirements for laboratory personnel. Laboratorians employed at specific employment levels thus must show credentials that coincide with their responsibilities.

THE FIELD DEFINED

Medical Laboratory Science (Medical Technology) is the health profession which deals with laboratory identification of microbes and physiologic changes that occur in diseases. These laboratory evaluations are invaluable tools in the diagnosis, treatment and prevention of disease. There are several specific disciplines within the medical laboratory area. The major areas are listed below:

Microbiology is the study of the microbes, namely bacteria, parasites, fungi and viruses. The method of identification may be by direct observation, growing of organisms on culture media, and observing specific use or change of biochemicals or by the detection of immunologic responses. The microbiologist also evaluates the effectiveness of specific antibiotics on specific organisms.

Clinical Chemistry is an analytical science involving the detection and quantitation of inorganic or organic compounds, and enzymatic activities.

Hematology is the study of blood and involves quantitation of various types of cells or cell fragments and morphologic and chemical evaluation of qualitative cell changes that occur, as for example, in physiologic responses to infection, in anemia and in malignant conditions such as leukemia.

Immunohematology or Blood Banking is in some countries a part of hematology. This science incorporates techniques for identification of human blood antigens and antibodies. The blood banker carries much responsibility as he/she is directly responsible for matching blood for transfusion purposes.

Histotechnology and Histology is the preparation of tissues by sectioning and staining techniques for observations of morphologic and chemical changes.

Cytotechnology is the preparation for observation and the actual screening for normal and malignant cells in body fluids.

Cytogenetics is the science of genetic mapping of chromosomes.

Nuclear Medical Technology is the use of radioactive isotopes for diagnostic purposes. It is a subspecialty of either clinical chemistry or radiologic technology.

The first four categories - Microbiology, Clinical Chemistry, Hematology and Immunohematology are usually part of the general medical technologist's background. Combinations of the major areas for the generalist's background and the degree to which specializations have occurred vary from country to country.

RECOGNITION/CERTIFICATION AND CREDENTIALS RECIPROCITY

Table I summarizes the educational requirements, the professional titles, and the certification recognition of medical laboratorians in the U.S. by two credentialing agencies offering both generalist and specialist certifications. Board examinations at various levels in specialist areas are also available through the American Society of Clinical Chemistry and the American Society of Microbiology.

There is currently no reciprocity for international laboratorians by the two major credentialing agencies in the United States, namely, the Board of Registry of the American Society for Clinical Pathologists (ASCP) and the National Certification Agency for Medical Laboratory Personnel (NCA). The NCA does recognize the Canadian Medical Technologists' Certification by permitting candidates to write the Clinical Laboratory Scientist (CLS) Examination, the higher level examination. The entry level Clinical Laboratory Technician (CLT) examination is open to candidates "attesting to clinical laboratory training and experience consistent with or superior to" stated requirements. For the latter, it is essential that equivalency of clinical laboratory training programs be established to spare the candidate the necessity of working four years in the United States before being allowed to write the examination.

The Board of Registry (ASCP) recognizes foreign medical technology clinical training programs as equivalent to one year of full-time clinical laboratory experience in the United States

TABLE I

LEVELS OF MEDICAL LABORATORY SCIENCE IN THE UNITED STATES

Degrees	Titles		Certification (1) ASCP	Certification (2) NCA
M.D.	*Clinical pathologist; Anatomic pathologist; Hematologists			
Ph.D.	Medical Laboratory Scientist; Microbiologists, Clinical Chemist			
	Laboratory Manager			Laboratory Manager, CL Mgt
M.S. or Experience	Specialists in	Microbiology	SM (ASCP)	
		Clinical Chemistry	SC (ASCP)	
		Hematology	SH (ASCP)	
		Blood Banking	SBB(ASCP)	
		Immunology	SI (ASCP)	
	*Generalist	*Medical Technologist	MT (ASCP)	
B.S. and Experience	Categorical	Microbiology	M (ASCP)	
		Clinical Chemistry	C (ASCP)	
		Hematology	H (ASCP)	
		Blood Banking	BB(ASCP)	
		Histotechnology	HTL(ASCP)	
60 sem. hrs. and Program or Experience	*Generalist Categorical			*Clinical Lab. Scientist CLS Chemistry CLS/C Hematology CLS/H Immunohematology CLS/IH Microbiology CLS/M Cytogeneticist CLSp (CG)
		Nuclear Med. Tech.	NM(ASCP)	
		Cytotechnology	CT(ASCP)	
A.S. with AD-MLT Program or 30 sem. hrs. and MLT-C program or Experience		Medical Lab. Technician	MLT(ASCP)	
		Histologic Technician	HT(ASCP)	*Clinical Laboratory Technician CLT

*GENERALIST LEVELS
(1) Board of Registry of the American Society of Clinical Pathologists
(2) National Certification Agency for Medical Laboratory Personnel

and this may be applied toward one of the five (5) years required for eligibility to write the Medical Technologist (ASCP) examination.

As pointed out by Mr. Margolis and Mr. Monahan in their 1980 publication for AACRAO, United Kingdom: Medical Laboratory Science, Occupational Therapy, Physiotherapy, there is recognition of foreign medical laboratory science credentials in the United Kingdom from twenty (20) countries. These specific credentials are "acceptable for state registration."

The United States credentials so recognized by the British are:

The Medical Technologist Certification MT (ASCP) at bachelor's degree level;

The "California Licensed Technologist" also at bachelor's degree level.

MEDICAL LABORATORY SCIENCE INTERNATIONALLY

The International Association of Medical Laboratory Technologists (IAMLT), an international association of national medical laboratory associations, has as its goal to document current information of the educational background of member nations. The task has proved overwhelming. Although initial information of the educational background of laboratorians in a particular country is made available at the time of the association's application to IAMLT, updated materials are not compiled on a regular basis.

With the encouragement of the President of the IAMLT and because of our interest and the need for an indepth study of the

content of the medical technology curricula from other countries, we set out to collect data for an international comparison of medical laboratory science programs. We mailed an inquiry letter to Ministries of Health in 148 countries and 39 IAMLT member associations in 37 countries requesting:

1. Information regarding the requirements for medical technologists in the specific country.

2. Lists of schools offering medical laboratory science programs.

From the latter group, we also requested information regarding the medical technology curricula at these specific schools.

For the purposes of our discussion, we have chosen to review the systems of medical laboratory science education in Belgium, Costa Rica, Sweden and the United Kingdom and compare these to the medical laboratory science education in the United States.

Our selection of these systems for comparison with the U.S. system was quite arbitrary. It was simply because we had the most complete information on medical laboratory science programs from these countries when we began to compile our data. Our case studies, on the other hand, are based on data from available student records and are selected in order to illustrate creativity and flexibility in evaluation, placement and curricular modification using a combination of the evaluation tools mentioned.

The professional education of medical laboratorians could be expected to be influenced by the system of health care

delivery and of the educational system and level of education in the particular country, and it is. Permit us to make the following generalizations.

In the United States, we have in the health care arena multiple types of health care delivery systems; that is, private hospitals, clinics, neighborhood health centers as well as small local community hospitals and larger city or state public hospitals. The overall picture is a mosaic of health care providers with multiple entry points and no set pathways for referral. The consequence is a variation of size of hospitals and clinics and a need for multiplicity of service at each site. The consequent effect on the educational preparation of medical laboratorians appears to be the continuous need for generalists.

The largest number of certifications issued are for generalists, the medical technologist or clinical laboratory scientist at the baccalaureate degree level and the medical laboratory technician or clinical laboratory technician at the associate degree level. Though certification levels exist for specialists in various disciplines, these, with the exception of blood banking, cytology and histotechnology, are not a result of formalized educational programs but rather the recognition of work experience.

All four of the other countries represented here: Belgium, Costa Rica, Sweden and the United Kingdom have national health insurance and forms of a national health care delivery system.

In two of the four - Sweden and the United Kingdom - there appears to be a great degree of formalized specialization which is probably most likely the effect of centralization of services and a systemized referral system that centralizes the more specialized services to a few medical centers.

In Sweden, there are several distinct educational tracks:

1. Clinical chemistry which does include hematology and blood banking.
2. Histopathology.
3. Clinical physiology which includes function tests such as cardiopulmonary testing and nuclear medicine.
4. Microbiology,
5. Biochemistry, a research track.

In addition, "clinical chemists" have opportunity for specialized training in blood banking, and histotechnologists in cytotechnology.

In the United Kingdom, the basic education includes all aspects of medical laboratory science but advancement requires specialization in one of the following:

1. Hematology and Blood Banking
2. Medical Microbiology
3. Clinical Biochemistry
4. Histopathology including Cytology

Formalized programs in specialties do not generally occur in small countries because of limited needs. As expected, then, Belgium offers only two formal areas of specialization: Clinical Chemistry and Industrial Chemistry. The Clinical

Chemistry program is polyvalent and includes hematology, microbiology, histology as well as clinical chemistry and graduates are thus generalists. Costa Rica, a smaller country in size and population, has one university program in medical laboratory science located in a microbiology department. It includes studies in all major areas and is thus generalist. Shorter training programs are available in nuclear medicine, histology and cytotechnology.

Level of knowledge vs. years of study

Although most evaluations guides caution admissions counselors not to rely too heavily in their admissions decisions on the years of schooling completed by an international applicant, but rather to consider the content of education, this is not commonly done. And for a reason. It is much easier to count years and consider for straight admission a student from a primary/secondary school sequence of 12 years, such as our own, than to attempt to acquire information about the curriculum completed before making an admissions decision.

It is thus too rarely that we consider the effective study time, that is the hours/week spent in study of, for instance, science subjects, as well as the number of days/year in the classroom. The number of days may vary from country to country as much as from 176 (France) to 240 (Germany) days per year. We also do not often take into account the age of students on entry into the primary cycle and consider, for

instance, the differences in maturity and absorption level between a Swedish 7-year old first grader and a 5-year old British first grader, who actually absorbs what is a kindergarten program.

It is differences such as these that make evaluations decisions so difficult, especially in the area of medical laboratory science. In many countries, medical laboratory programs are offered at the secondary level, following 9/10 years of primary/secondary education. In some cases, these programs also admit secondary school graduates so that we have a mixture in the classroom: middle school and senior high school graduates attending the same classes. This poses a dilemma for the evaluator. It is clear that we can consider the credentials of the graduate with the middle school background and admit him/her as a freshman but what should we do about the graduate with secondary school background? She/he completed a full secondary school course; could the 3 years of medical laboratory science training thus be considered post-secondary or college level in his/her case? If, as in some Finnish medical laboratory programs - still by the government considered secondary level training - 90% of the students are secondary school graduates, should we automatically classify them for straight freshman admission or should we carefully compare the syllabi with our own courses and, if found sufficiently similar, award advanced standing credit? Or should we be even more thorough and go back to the science courses completed over the secondary sequence to see how they compare (by hour/week) with United

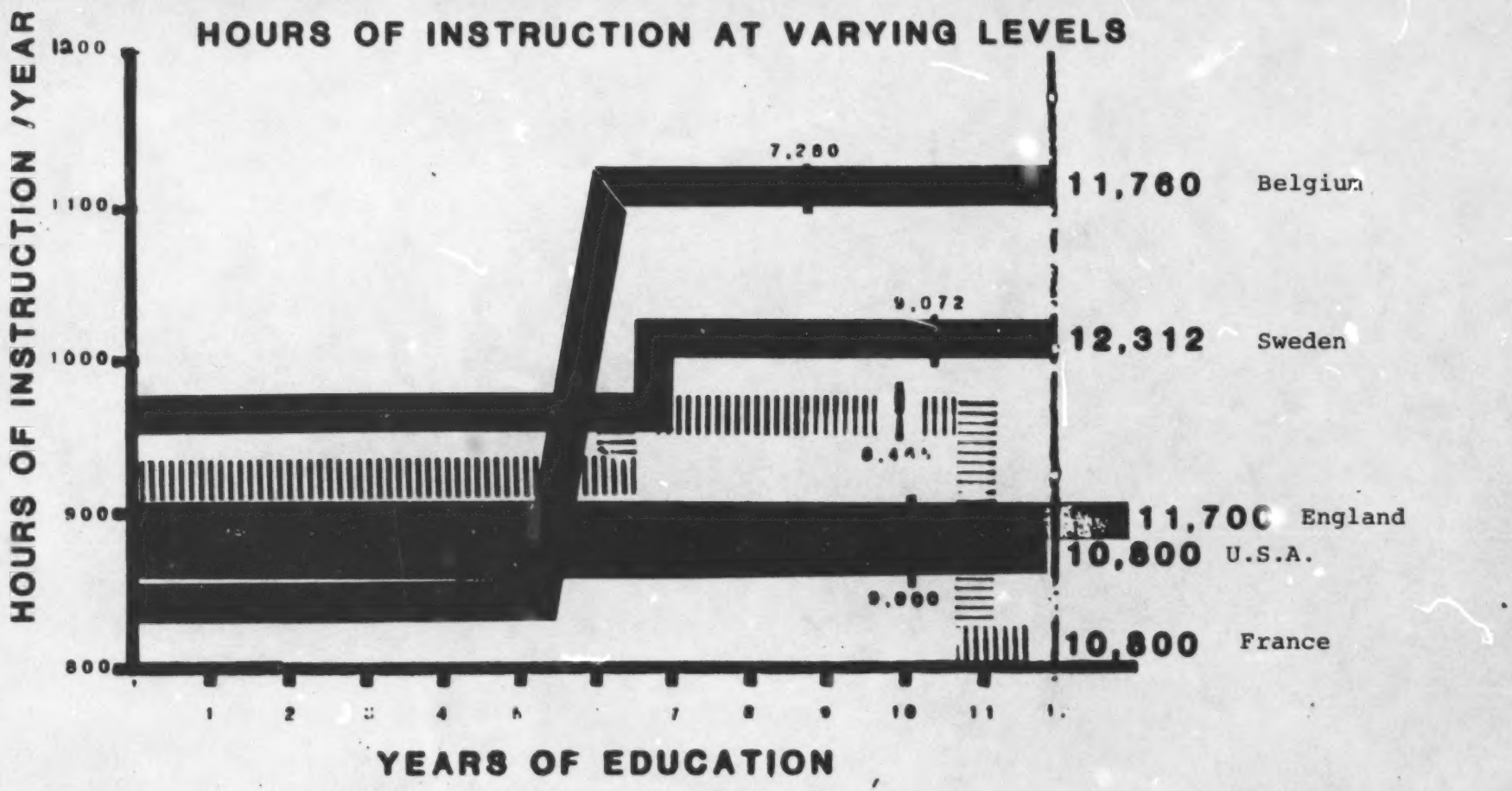
States science programs? Far too often, we do not have the time or the background information to undertake the careful scrutiny required to be completely fair to international applicants.

In our proposed study, we will consider some of the above questions and their implications for our evaluations and licensing decisions. For our presentation here, we have included some illustrations of the preceding discussion which we hope you will find interesting.

Table II shows the total number of instructional hours over the primary/secondary sequence in certain European countries. This example is based on The National Case Study by A.H. Passow. Some 900 hours/year of study seem to be standard, but look at the variations: Belgium and Sweden rapidly increase their annual totals in the secondary school - so that Belgian students arrive at practically the same number of total contact hours as the Swedish students over the course of their primary/secondary sequence. Swedish students come out way ahead in total hours of instruction, and French students attend a decreased number of hours in upper-secondary school compared to in the middle school, while the U.S. provides an average load.

The effectiveness or quality of education also is a function of the number of students allowed to participate in the educational process. An elitist system of education, admitting only some 15% of the age group to the upper secondary school will show different success rates in examinations than will an open system such as that of the U.S., which has

TABLE II



THE NATIONAL CASE STUDY
An Empirical Comparative Study of Twenty-one Educational Systems,
A. H. Passow et. al. 1976 pp.284.

virtually mass education at the upper secondary level (grades 9-12).

Table III shows the rate of access to upper secondary education in the five (5) countries we are discussing today. It is interesting to note that the level of access to secondary school coincides with the level at which medical laboratory science programs are offered. In those countries with more restricted access to the secondary level, medical laboratory science programs are at the secondary level; those with more open access have post-secondary medical laboratory science programs. There is probably no direct cause and effect. More likely, the decisions as to training level are made as a result of the cost effectiveness of the training and the needs of the national health delivery system. Another reason might be the sexual division of labor and the interest in providing short-term training of interest to women. It should also be noted that Sweden moved its training programs into the postsecondary sector in 1982.

How does all this affect our evaluations decisions? Why should we consider the annual hours of study, the level of access? Knowing that the science preparation at the middle school level is substantial and that the medical laboratory science programs in the applicant's country are offered at the secondary level - although large numbers of secondary school graduates attend - might assist us to arrive at a more creative admissions decision. We might not be able to give transfer or advanced standing credit because the programs are too clearly labeled "secondary", but we can consider the syllabi

TABLE III

ACCESS TO UPPER SECONDARY/FULL-TIME SCHOOL ENROLLMENT GRADES 9-12

	1979	1975	Level of Medical Laboratory Science program
Belgium	61.3% (1975)	61.3	Post-secondary
Sweden	56.3% (1976)	57.1	Secondary
U.K.	46.2% (1977)	33.9	Secondary
U.S.	75.0% (1979)	72.0	Post-secondary
Costa Rica	47.0% (1979)	37.0	Post-secondary/ secondary

Source: OECD Observer
March 1982

UNESCO Statistical Yearbook
1982

and offer the student an opportunity to prove that his/her background is as good as he/she believes it is by making available CLEP and/or challenge examinations that will allow the applicant to be measured by the true measuring device: level of knowledge. For the students' continued study in the U.S., it is essential that the expected basic science materials be covered. A lack of such knowledge would interfere with the students' success.

COMPARISON

We will present a brief description of the educational background of medical laboratorians in the four countries we have selected for discussion and we also have attempted a comparison of the four with the general training program in the U.S.

Belgium: Outline of Medical Laboratory Science Training

Students enter medical laboratory study following completion of the 12-year cycle of primary/secondary education, which culminates in an examination for the diploma qualifying for higher education. This examination is considered equivalent to completion of British A-levels.

The Belgian medical laboratory science programs are three-year programs offered in one of the post-secondary colleges of advanced technology, generally in a department of laboratory technology. There are two variations: 1) the clinical chemistry specialization; that is, what we in the U.S. consider medical technology study, and 2) an industrial specialization that trains technologists for industry. The three-year program

requires approximately 15 hours per week of theoretical study and some 15-17 hours of laboratory work for a total of 32 hours per week. It is also possible for students to include one elective course, such as photography, stenography, informatics or isotope techniques. Table IV shows the weekly breakdown for a typical 3-year program. Included is a clinical rotation undertaken outside the institution during the third year, generally composed of 12 hours/week.

During the third year students also have to complete a thesis on a subject they have been studying in depth during their practical laboratory training.

To be certified, candidates have to achieve at least 50% in each examination and a 60% average. The title received is medical laboratory technologist, but the diploma is generally called diploma of clinical chemistry.

The diploma gives access to programs at the university and graduates can continue their study in a specialization toward the degree Licence. This degree then qualifies them for further study up to the Ph.D. level. The Belgian programs thus offer good career mobility for graduates.

Costa Rica: Outline of Medical Laboratory Science Training

Training for the medical laboratory professional in Costa Rica is offered in the Faculty of Microbiology at the University of Costa Rica in a degree program lasting 5+ years and leading to the first degree, the Licenciado in microbiology and clinical chemistry. The program is generalist and includes training in all major areas of study (see Table V).

TABLE IV

Reference: REGA School

CLINICAL CHEMISTRY

Belgium

General subjects	Hours of classes/week First Year Theory	First Year Lab	Second Year Theory	Second Year Lab	Third Year Theory	Third Year Lab
Math and Statistics	1	2				
Physics	3	5				
General & Analytical Chemistry	4	10	1	2,5		
General Biology	2		2		1	
Biochemistry						
General Pathology			2			
Psychology	1					
Technical subjects						
Technical English	1		1			
Clinical Chemistry			2	4,5		6
Histology & Histopathology			1	3		
Hematology & Clinical Microscopy			1	3		6,5
Microbiology & Parasitology	1	1	2	3		6,5
Hygiene			1			
Human Development	1		1			
Special subjects: Informatics, Isotope techniques, etc.			1	1		
Practical Training					12	
TOTAL	32		32		32	

TABLE V University of Costa Rica - Faculty of Microbiology Program

COURSE	THEORY	LABORATORY
General Chemistry I	4	3
Spanish	4	-
Fundamentals of Philosophy	4	-
History of Culture	4	-
Fundamentals of Sociology	4	-
General Chemistry II	4	3
General Biology I	2	3
Physics for Biologists I	4	-
General Mathematics for Biologists I	4	-
General Zoology	3	3
Basic English I & II	3	-
Physics for Biologists II	4	3
Analytical Quantitative Chemistry	3	6
Organic Chemistry I	4	3
Organic Chemistry II	4	3
General Histology	2	4
Human Anatomy	2	4
General Mathematics for Biologists II	5	-
Human Physiology	3	3
General Pathology	2	6
Instrumental methods	1	3
Biochemistry	10	8
Immunology & Serology	3	6
Medical Mycology	3	6
Medical Protozoology	3	6
General Microbiology	3	6
Immuno-hematology	1	3
Medical Bacteriology	3	6
Medical Virology	2	6
Medical Helmintology	3	6
Water Microbiology	1	4
Hematology	3	6
Medical Anthropodology	3	6
Biostatistics	3	-
Epidemiology-Public Health	3	-
Food Microbiology	2	4
Clinical Chemistry	3	6
Clinical Laboratory Practice	6	18
General Entomology	2	2

Source: Description of Courses. Faculty of Microbiology and Clinical Chemistry. University of Costa Rica, 1982.

Certification as a medical laboratorian is open only to the licenciado graduates.

Certain shorter technician programs also are offered by the university to secondary school graduates: Cytology technician (12 months), Histology technician (12 months), Nuclear medicine technician (12 months). These shorter programs are offered in the Faculty of Medicine.

Sweden: Medical Laboratory Technologist Training

In Sweden distinction is made between laboratory technicians, who complete an eight-week course of training at the secondary level, and the medical laboratory technologist who is the professional in the area of medical laboratory science. Since July 1982 when the 13 laboratory schools were moved into the higher education sector, the educational program has been college-based as in the U.S. rather than employment-based as in the United Kingdom and is standardized throughout the country.

Entry to medical laboratory study now requires completed secondary school with a secondary education background in specializations such as health studies, or with at least two years of upper secondary study in areas such as mathematics, natural sciences, economics or social sciences.

When moved into the higher education sector, the programs were updated to provide practitioners with a more thorough theoretical background which could form the basis for further study or research and also provide greater job mobility. They were also designed to train technologists who can work independently and creatively with an understanding of the totality

of health care delivery.

The training of medical laboratory technologists is specialized into five different areas:

Clinical Chemistry (including Hematology and Blood Banking)

Microbiology

Histopathology

Clinical Physiology

Biochemistry/Medical Chemistry

The study program lasts 90 weeks -- according to Swedish measurements this is 90 points - or 2¼ academic years as each year is 40 points.

The study is divided into three major course-segments as outlined in Table VI. The first two segments A and B, offer the basic introduction to the field for all five specializations. Segment C gives the required specialization in a 40-week program which also includes a period of laboratory practice (generally 20 weeks) in a hospital, primary health care facility or other suitable location.

There is also opportunity for additional specialization within the medical laboratory sector: a 24-point program in clinical cytology and a 6-point program in blood group serology are available.

Under the Swedish system of lifelong education, possibilities also exist for additional coursework leading to higher qualifications.

United Kingdom: Medical Laboratory Science Training

Medical laboratorians in Britain are referred to as Medical Laboratory Scientific Officers (M.L.S.O.) and the career structure

SWEDEN

Table VI

CURRICULUM

90 weeks training course preparing for a position as a
Medical Laboratory Technologist
University certificate (US) in Medical Laboratory Technology, 90 points
1 point = Full time studies one week

A - Basic Science
B - Basic Professional
C - Specialization

SUBJECTS	Biochemical-medical Chemistry			Histopathology			Clinical Physiology			Clinical Chemistry			Microbiology		
	A 20p	B 30p	C 40p	A 20p	B 30p	C 40p	A 20p	B 30p	C 40p	A 20p	B 30p	C 40p	A 20p	B 30p	C 40p
A															
1. Course directed on natural science/alt. to care (depending on earlier knowledge of the student)	10			10			10			10			10		
2. Base course 10p															
Introduction	1			1			1			1			1		
Basic science of method	5			5			5			5			5		
Behaviour science	2			2			2			2			2		
Courses directed on social conditions	2			2			2			2			2		
B General Laboratory Methodics 30p															
Descriptive statistics		3			3			3			3			3	
Physics		8			8			8			8			8	
Chemistry Organic Chemistry Cell-Biology Biochemistry		11			11			11			11			11	
Immunology		2			2			2			2			2	
Laboratory Methodics		6			6			6			6			6	
C Biochemistry			8												
Biochemical Methodology			10												
Special work			2												
Laboratory Practice			20												
Histology Histopathology incl. Clinical Cytology Histochemistry and Dyeing Chemistry						8									
Morphological Methodics						10									
Special work						2									
Laboratory practice						20									
Clinical Physiology									8						
Clinical Physiological methodics									10						
Special work									2						
Laboratory practice									20						
Clinical Chemistry												6			
Clinical Chemical Methodics												10			
Bloodgrouping and Serology												1			
Special work												2			
Laboratory Practice												19			
Microbiology General and special Bacteriology General and special Virology Mycology Parasitology Clinical Immunology Special Theory of deseases and Pharmakology															9
Microbiological Methodics															10
Bloodgrouping and Serology															1
Special work															(2)
Laboratory Practice															20
Subtotal	20	30	40	20	30	40	20	30	40	20	30	40	20	30	40
Total	90			90			90			90			90		

is governed by the Department of Health and Social Security. Since 1979, approval of the training curricula has rested with the Technician Education Council (TEC) which in 1983 merged with the Business Technician Council to become the Business and Technician Education Council (BTEC). The professional bodies concerned with the levels of examinations and registration in the profession are the Institute of Medical Laboratory Sciences (I.M.L.S.) and the Council for the Professions Supplementary to Medicine (C.P.S.M.). When the TEC was constituted in 1979, major changes were made in the training programs. Charts I and II outline the differences between the old and the new programs. Although the system of training is quite standardized throughout the country, individual colleges use the basic BTEC syllabus to write their own programs (which have to be submitted to BTEC for approval). As a result there are some minor differences in the program structure from college to college.

Practically all the British MLS training is employment-based and the theoretical study is undertaken on a part-time basis (one day and one evening a week) although some full-time programs exist. There are three basic levels of training which offer career mobility in accordance with individual desires:

(1) The Certificate level admitting students (who are employed as Junior Medical Laboratory Scientific Officers by the Local Area Health Authority) with an educational background generally approximating that of a U.S. high school diploma. The programs generally last 2 years although some students,

CHART 1

UNITED KINGDOM
OLD SYSTEM

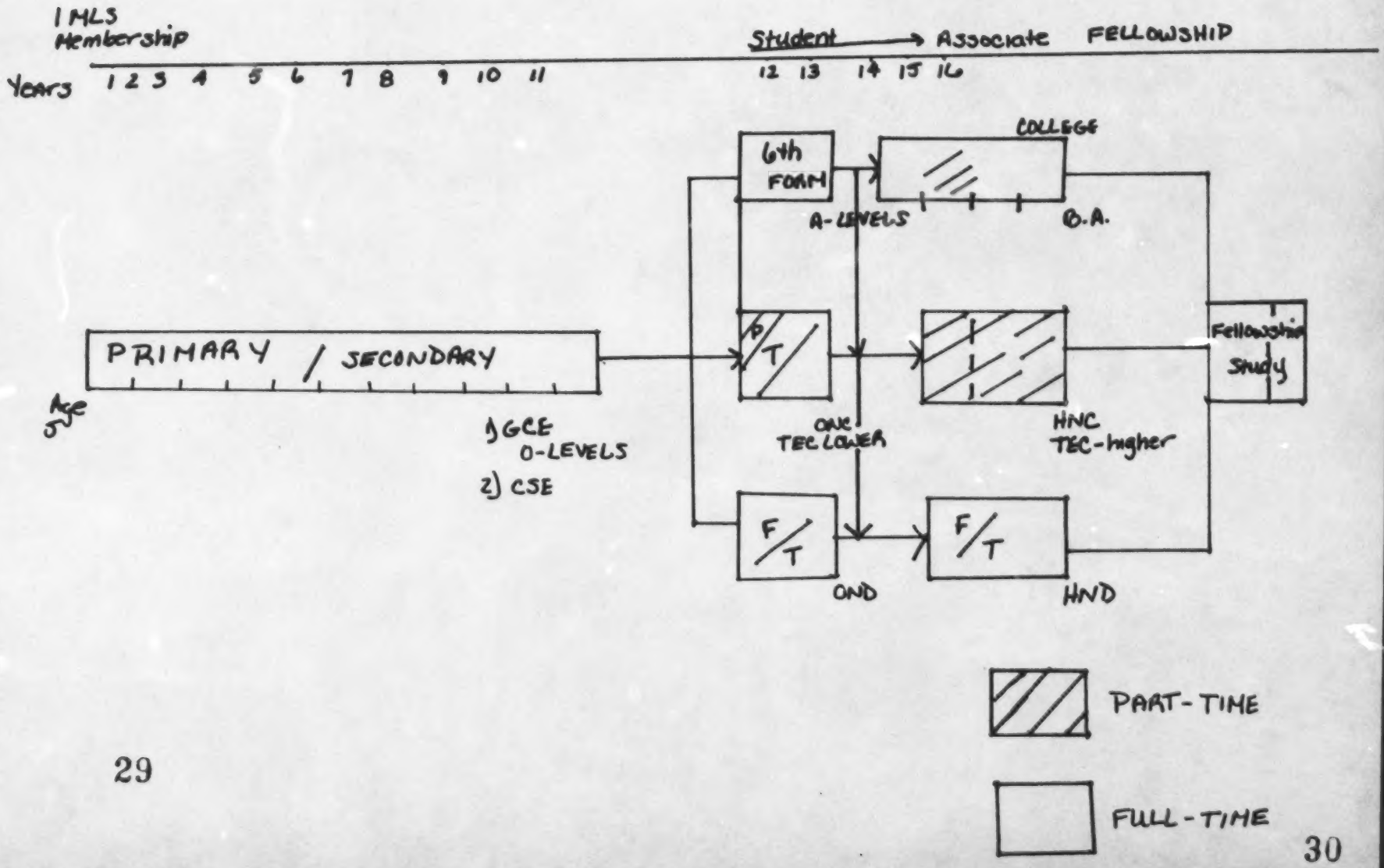
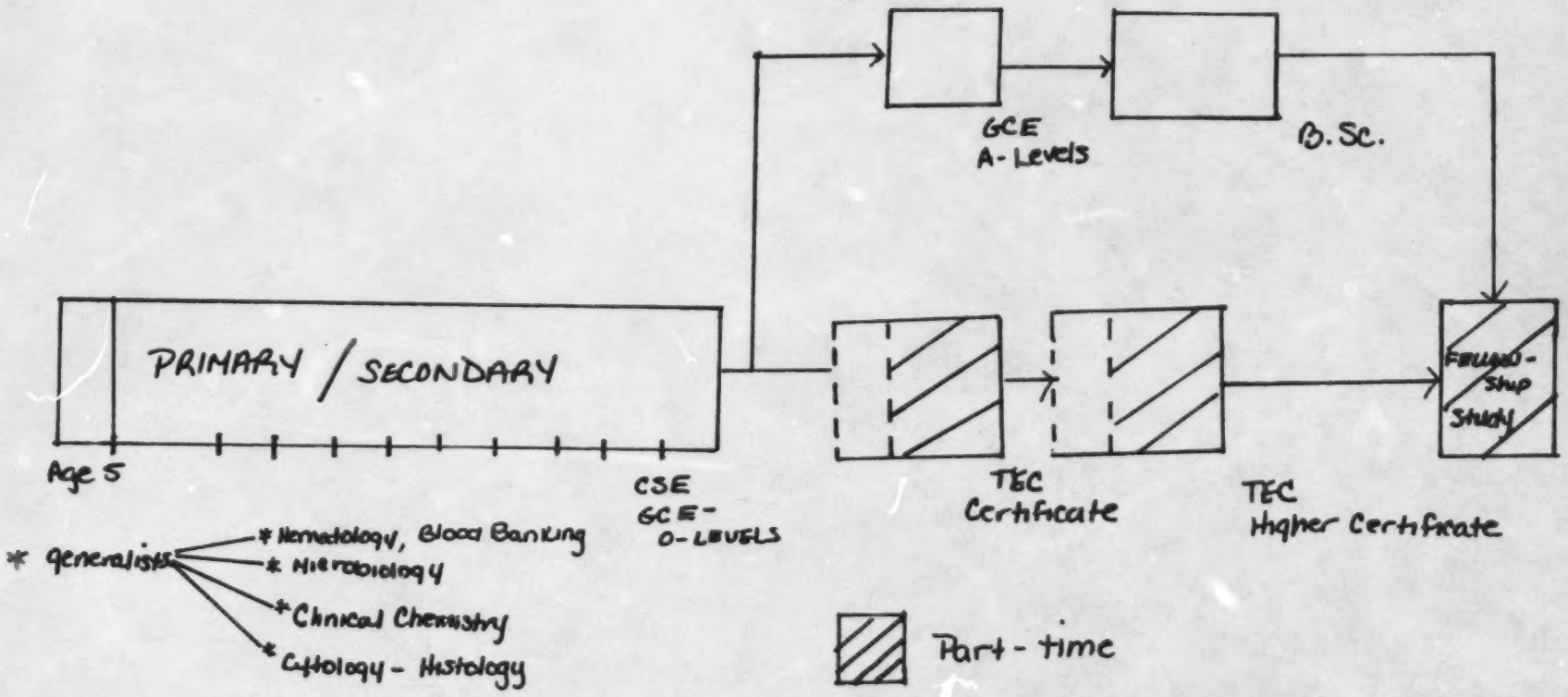


CHART 2

UNITED KINGDOM
NEW SYSTEM

I MLS - MEMBERSHIP — STUDENT (LEVEL I) — ASSOCIATE (LEVEL II)

Years 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16



* Work experience in hospital

depending on their educational level on entry, require a one-year foundation course.

(2) The Higher Certificate level which is open to graduates of the Certificate programs as well as to students who fulfill standard university entrance requirements in terms of A-levels in the sciences. Programs generally last 2 years. The former Higher National Certificate which is now called Higher Certificate in Medical Laboratory Subjects is the standard qualifying certificate for registration with I.M.L.S. as a Medical Laboratory Science professional or Associate member.

(3) The Fellowship level: On completion of the Higher Certificate the medical laboratorian can continue with a further two-year, part-time course specializing in an individual area of Medical Laboratory Science to a higher level: bacteriology, blood group serology and transfusion, clinical chemistry, hematology, histopathology, virology. These courses lead to fellowship in the I.M.L.S. which is the highest award in medical laboratory science.

It is also still possible for the Associate Member to obtain fellowship through an I.M.L.S. special examination or by thesis. Eventually, however, attendance in courses will be mandatory.

In addition to those students who enter Fellowship study in the traditional way through the Higher Certificate, an increasing number of students (some 25% in certain colleges)

now enter with a bachelor's degree in sciences. Our respondents seemed to indicate that recruitment of science graduates is currently considered to be in the interest of the profession. They also indicated that those laboratorians who achieve Fellowship in I.M.L.S. are ready for management study at the graduate level or for entry into Ph.D.-level study in Britain.

Summary of the Comparison of Four Systems with that of the United States

Table VII summarizes the science requirements for professional recognition of medical laboratory science or medical technologists in Belgium, Costa Rica, Sweden and the United Kingdom as compared to the minimum science requirements for a baccalaureate major in medical technology in the United States. For the U.S., Belgian, Costa Rican and British systems we have calculated the credits to semester hours. The Swedish system records the credits as "poäng" or points. One point we have approximated to be equal to 0.8 semester hours. Both are recorded. It should be noted that in the U.S. it is not unusual for specific programs to have additional requirements. Of importance also is that at the technologist or clinical laboratory scientist level certification agencies in the United States do not accept blanket credits for foreign clinical or professional courses or work experience as substitution for clinical courses or work experience in the United States.

For credits that are not readily apparent for award of transfer credit there are, of course, the options of confirming

TABLE VII APPROXIMATIONS OF "SEMESTER HOURS" OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY EDUCATION

U.S. Minimum for BS MT Major*	Belgium (Rega School)	Costa Rica Univ. of C. R.		Sweden (New System)	United Kingdom Clin. Chemistry HNC
Pre-Clinical					
SH **	SH (Calc)	SH	SH	Poäng ***	SH (Calc)
16 chemistry	12 gen. anal. chem.	8 gen. chem. 10 organic chem. 5 anal. chem. 13 biochem.	8.8	11 chem. org. chem. bio. chem.	8 cell physio. & biochem.
16 biological science (inc. microbiology)	4 gen. bio. 4 pathology 4 histology 4 hematology	4 gen. bio. 4 zoology 4 anatomy 4 histology 6 microbiology	8 1.6	10 "natural sciences" 2 immunology	4 environmental 8 vert. physio. 8 control. bio. 4 genetics or bio. instr. 5 physiology 5 pathology
1 sem. mathematics	2 statistics 8 physics	5 math (for biologists) 5 physics	6.4	8 physics	
Clinical at Hospital (4th Year)	Hospital (3rd Yr)	Hospital (4th & 5th Yr)		Hospital (3rd Yr)	Continuous Work Experience
32 Professional course credits include: clinical chemistry microbiology blood banking hematology	6 clin. chem. 4 microbiology 4 hematology incl. blood banking	75 credits in: microbiology hematology blood banking chemistry		Specialization 40 poäng in: 1. clin. chem. incl. hematology, blood banking 2. medicinal chem. 3. histopathology 4. clin. physio. or 5. microbiology Added specializations in: cytology blood banking	8-16 in Speciality, i.e. 1. hem./BB 2. med. micro. 3. clin. biochem. or 4. histopathology

*ASCP requirements
** SH = semester hours
*** 1 poäng - 0.8 semester hours

background knowledge by College Level Examination Program (CLEP) examinations or by departmental challenge examinations. CLEP does provide examinations in the following science areas:

General Biology
Anatomy
Physiology
General Chemistry
College Algebra
College Algebra and Trigonometry
Trigonometry
Calculus with Elementary Functions
Microbiology

Didactic subject examinations in clinical chemistry, hematology, immunohematology and blood banking are available. Since these examinations do not test laboratory practice colleges should not expect to use these as equivalency examinations for clinical laboratory practice.

In addition, the American Chemical Society provides chemistry examinations in general, analytical, organic and physical chemistry and biochemistry. These are available through many college chemistry departments.

Successful completion of these examinations can be recognized as equivalent to courses. Credits for these examinations are generally not considered by credentialing agencies unless these credits are accepted by a college or university as substitutes for specific courses in their own curriculum. Departmental examinations are available through some college departments. The Northeastern University Medical Laboratory Science Program allows students with background in a specific subject to take challenge examinations. It is understandable that departments are reluctant to offer these time consuming special examinations. We have, however, found that it is

possible for candidates to take the scheduled examinations in the regular classes. Using this avenue it becomes possible to incorporate laboratory performance evaluations which are so critical in the medical laboratory science field.

CASE STUDY #1 (See p. 23)

This young mother came to Northeastern during Fall registration week asking what program there might be at our university that would allow her to study in the medical laboratory science area while she was in Boston. Her husband was completing a master's degree in public health at Harvard University. She and her family would be able to stay in the Boston area somewhat less than 11 months. Her education included the title "Diplom Chemiker" and the Diploma in Lebensmittelchemie (food chemistry) from the University of Bonn in Germany. In addition, she had about one and a half years of laboratory work experience in the rural hospital in Botswana where her husband served as the only physician. She had learned some of the basic clinical laboratory techniques at a somewhat larger hospital where she had volunteered for a shorter period of time. Because of limits of time and her desire for a program that was broad in spectrum, she chose to apply to the three-year associate degree level medical laboratory technician program.

After a preliminary review of her credentials by representatives of the Center for International Higher Education Documentation, the admissions office and the departmental admissions staff, a tentative schedule was prepared and she

started as a special student taking the courses essential to the program and available in the Fall quarter. The summary description indicates:

1. the number of courses that were transferred from the University of Bonn;
2. the total program requirements;
3. the special considerations.

In order to complete the associate degree programs, the following adjustments were made:

1. Based on her previous laboratory work experience the student was exempted from the six-month work component which is a part of this cooperative education program.

2. The student's mastery of English allowed her to successfully complete a CLEP examination in English preventing the necessity of additional courses.

3. A willing faculty member agreed to give the departmental challenge examination in clinical chemistry when a scheduled evening course in her program was cancelled. Independent study of this subject and the very extensive chemistry background of this student made it possible for her to complete this component successfully.

4. The Clinical Applied Studies in the hospitals were rearranged by using vacation time so that the student could complete this component of the program in time to write the ASCP Medical Laboratory Technician Examination given the third week of August.

5. Exceptions from required MLS Orientation and Professional Dynamic courses were granted based on the student's general knowledge and the fact that she had more electives than needed for the degree.

Incorporated into the regular clinical applied study it was also possible to schedule a one-week workshop in parasitology and time for observing new methods in tuberculosis identification. These components are not usually part of the associate degree program but were identified as very desirable preparation for this international student who plans to return to work in Zimbabwe.

CASE STUDY #1

INTEREST - Medical Laboratory Science - (MLT) - (A.S.)

BACKGROUND - "Diplom Chemiker" - University of Bonn

"Lebensmittelchemie" - University of Bonn, W. Germany

TIME CONSTRAINT - September 1983-August 1984

TRANSFER CREDITS

TERMS OF ACCEPTANCE

Credit is granted for previous study at University of Bonn as follows:

	56 SEMESTER HOURS	75 QUARTER HOURS
Chemistry	8	
Organic Chemistry	8	
Mathematics	8	
Biology	8	
Soc.Sci./Humanities	16	
Physics	8	

Additional transfer credit must be worked out with the department.

PROGRAM REQUIREMENTS

	QH		QH		QH		QH
Math	8	Bio.	8	Eng.	8	Clin.	3
Chem.	8	Physiol.	8	Elect.	8	Micro.	6
Anal. Chem. (later transfer)	4					Hem. I	3
						Hem. II	3
						BB	3
						Clin.Chem.	5
						Immun.	3

12 QH Applied Clin. Studies

SPECIAL CONSIDERATIONS

COOP WORK - exemption

ENGLISH by CLEP

COMPLETION OF CLINICAL CHEMISTRY BY EXAMINATION

REQUIREMENT OF CLINICAL TIME SEQUENCE

EXEMPTION FROM MLS ORIENTATION AND PROFESSIONAL DYNAMICS

CASE STUDY #2 (See p. 26)

This young man came from Iran and had studied for one year at three different colleges in the United States. In his home country he had completed a two-year associate degree (laboratory technician) program in the Pathology Department of Pahlavi University in Shiraz. In retrospect it might be that we and the other universities are guilty of overlooking some potential transfer credits in mathematics and physics from Pahlavi University. In fairness to the evaluators, however, this transcript may not have been submitted with the original application as it was not initially submitted at our institution. The summary description indicates the number of courses that were transferred from U.S. colleges.

A subsequent review of the student's Iranian transcript did indicate that he was a good candidate for departmental challenge examinations. He chose to challenge the following basic medical laboratory science courses:

- Urinalysis
- Hematology
- Blood Banking

He felt, however, that the content of the Basic Microbiology and Clinical Chemistry courses was sufficiently different to warrant his taking these courses.

Further evaluation of courses completed at Stonehill College allowed transfer of 4 quarter hours of Anatomy and Physiology.

Additional adjustments included:

1. reduction of the required coop work experience
2. sequencing of the clinical components

We were able to give the student the opportunity of added clinical experience in a public health laboratory and, as part of his senior studies, he prepared a report evaluating the relevance of U.S. technical education for students from developing nations, giving many suggestions as to how U.S. institutions may better serve the international health professions major.

CASE STUDY #2

INTEREST - Medical Laboratory Science (BS)

BACKGROUND - "Associate Bachelor in Laboratory Technician (Pathology)"

- 2 year Program - Pahlavi University, Iran

ORIGINAL TRANSFER

University of Tulsa

Gen. & Anal. Chemistry	4 Semester Hours
College Algebra	3
Intro. Computers	3
English Comp. International Students	3

Claremore Junior College

Amer. Fed. Government	3 Semester Hours
U.S. History to 1865	3

Stonehill College/

Calculus	3 Semester Hours
English Literature	3
Biology I	3
Middle East Today	3

PROGRAM REQUIREMENT

	QH		QH		QH		QH		QH
Math	8	Bio.	8	Eng.	8	Urin.	3	Adv.Micro.	6
Chem.	8	Physio.	8	Hum.	12	Micro.	6	Adv. Hem.	5
Anal. Chem.	4	Genetics	4	Soc.		Hem.I	3	Adv. Clin.	
Org. Chem.	8	Cell Bio.	4	Sci.	12	Hem. II	3	Chem.	6
Physics	9	Micro.	3	Free		B.B.	3	Adv. B.B.	2
				Elec.	12	Clin.		Mgmt.	2
						Chem.	5	Ed.	2
						Immun.	3	RIA	2
						Myc.	3	Review	2
						Parasit.	3		
								Applied Clin. Studies	21

SPECIAL CONSIDERATIONS

COOP WORK - Reduced by three quarters

CHALLENGE EXAMS - Basic MLS
Urinalysis, Hematology, and Blood Banking

PROBLEM - Repeated Mathematics and one Physics course

SUMMARY AND CONCLUSION

We have outlined in one field of study -- medical laboratory science -- the need for detailed accurate evaluation of the total educational preparation of international applicants including secondary school and professional education. We have also indicated methods by which this may be accomplished in other fields as well as in medical laboratory science. Appropriate level of placement is often difficult to determine for the international student who comes to the United States for further studies. However, if his/her background does not cover prerequisite course requirements, the student is likely to experience failure in related future courses; if not placed at advanced enough level, repetition of courses becomes unnecessarily expensive both in time and finances and often leads to discontent.

For permanent residents who seek evaluation for job placement, there is a direct parallel between academic level recognition and professional level placement and, thus, the earning capacity of that individual. In both instances, when in doubt, appropriate academic level recognition can be facilitated by the use of national or local challenge examinations.

In addition we recommend that greater flexibility be used in outlining the student's U.S. curriculum in order to incorporate more relevant work useful both to the international student's professional development and to the needs of the home country. This, we contend, can be done without a lowering of academic standards if U.S. faculty are sensitive to such needs. U.S. faculty can not only enrich the international student's education by including subjects of greater relevance to the needs of the

student's country, but they can begin the internationalization of their university by bringing global issues to the classroom and allowing for alternative methods to look at a subject and thus enriching the background of domestic students as well. As indicated in the case studies, the relevance of the foreign student's professional education can also easily be increased by adding useful extracurricular professional activity to the total educational experience.

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Margolis, Alan and Thomas Monahan. United Kingdom: Medical Laboratory Science, Occupational Therapy, Physiotherapy. Washington, D.C.: AACRAO, 1980.

Passow, Harry A. The National Case Study: An Empirical Comparative Study of Twenty-One Educational Systems. New York: John Wiley, 1976.

Universidad de Costa Rica. Catalogo Universitario.

Addresses

National Professional Associations for Medical Laboratory Technologists

Belgium	B.V.L.T.	Belgische Vereniging van Laboratorium Technologen Postbus 205 B-3000 Leuven
Sweden	S.L.F.	Svenska Laboratorieassistentföreningen Östermalmsgatan 19 S-11426 Stockholm
U.K.	I.M.L.S.	Institute of Medical Laboratory Sciences 12 Queen Anne Street London W1M OAU
	T.E.C.	Technician Education Council Central House, Upper Woburn Place London WC1H OHH
U.S.	A.S.M.T.	American Society for Medical Technology 330 Meadowfern Drive Houston, Texas 77067
	A.A.C.C.	American Association for Clinical Chemistry 1725 K Street, N.W. Washington, D.C. 20006
	A.S.M.	American Society for Microbiology 1913 I Street, N.W. Washington, D.C. 20006

International Association of Associations of Medical Laboratory Technologists

International Association of Medical Laboratory Technologists (IAMLT)
External Relations Unit
Liverpool Polytechnic
Bryan Street
Liverpool L3 3AF
United Kingdom

U.S. Accrediting Agency for Programs for Medical Technologists, Medical Laboratory Technicians, and Histologists

(Determines eligibility of candidates who wish to enter these professional programs in the United States)

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)
547 West Jackson Boulevard
Suite 608
Chicago, Illinois 60606

U.S. Credentialing Agencies in Medical Laboratory Science

Board of Registry (ASCP)
P.O. Box 12270
Chicago, Illinois 60612

National Certification Agency for Medical Laboratory Personnel (NCA)
1725 DeSales Street, N.W.
Suite 403
Washington, D.C. 20036